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Competition Panel by Brunelleschi

A HISTORIC COMPETITION

The Sacrifice of Isaac

An Angel stops Abraham as he is about to sacrifice Isaac, pointing instead to a sacrificial ram.

Two servants wait with a donkey.

Competition Panel by Ghiberti



FILIPPO BRUNELLESCHI, Architect-Engineer

By PERRY BORCHERS

IN THE year 1402 A. D., the city of Florence in Italy was one of several Italian city-republics, racked by plagues and disease, disturbed by riots of the populace and murders in the streets, torn by clashes between the great families, oppressed by tyranny and corruption of officials, and distinguished by treacherous diplomacy and frequent wars with the neighboring cities of Milan, Lucca, and Venice. Yet Florence was proud and prosperous and active in foreign trade, her citizens fiercely patriotic and proudly aware of the skill and craftsmanship of her many artists and artisans.

In that year a famous competition was held and judged in Florence. Its purpose was to select a sculptor to execute a pair of great bronze doors for the Baptistry of Florence, but the contest is remembered chiefly because it changed the career of a very remarkable man whose influence was to be felt in the art, architecture, and construction throughout Europe during the next four centuries.

The subject of this competition, the Baptistry of Florence, was one of three structures in the great Gothic cathedral group of Santa Maria del Fiore. Florence contested with rival cities not only in war and trade but in size and magnificence of public edifices as well, and by this cathedral group she planned to surpass all other Italian cities.

Of the three buildings only one was in a finished condition, the "Campanile" or bell tower, begun by the distinguished artist Giotto in 1334, continued by Andrea Pisano, and completed in 1387. The largest structure, the Cathedral itself, had been designed over a century before, and had been progressing in a desultory fashion ever since, but still lacked what was to be its crowning feature, a huge dome so large as to present unsolved problems of construction. The third building was the subject of this famous competition of 1402: It was the Baptistry of San Giovanni which housed the baptismal font of the Cathedral.

The Baptistry had been raised in 1290 by Arnolfo di Cambio, who was also the first architect of the Cathedral. During the years 1330-1336 a pair of great bronze, sculptured doors were added by the sculptor Andrea Pisano. These doors were the pride of all Florence. Each of the many panels contained a Bible story in beautifully sculptured figures. How near and how real the Savior and his disciples and the prophets seemed in these sculptures! What a pity that the other two doorways were so plain and so barren of ornament!

Therefore in 1401 the city council of Florence announced a competition to select a sculptor to execute a

second pair of doors for the Baptistry. The winner of the commission would be decided on the quality of a single panel to be done by the contestants in bronze relief illustrating the story of Abraham's offering of Isaac as a sacrifice to God.

Among the famous or aspiring goldsmiths and sculptors of Florence and Tuscany who competed for this commission were Lorenzo Ghiberti and Filippo Brunelleschi. Ghiberti, 23 years old, was a goldsmith, a profession which then embraced all forms of artistry, such as die-casting of coins, jewel setting, ivory carving, sculpture, and bronze casting. He had gone to the neighboring city of Rimini the year before to escape a plague which was raging in Florence, but hastened back when advised of the competition. Filippo Brunelleschi was a year older than Ghiberti. His interest as a boy in all kinds of mechanism had led his father to place him in the guild of goldsmiths, and there he became proficient in sculpture, in the science of perspective, and in geometry. Though small and unimpressive in stature, he already showed signs of enormous energy and an intense desire for success.

When the panels were submitted, those by Ghiberti and Brunelleschi were easily recognized as the best, but between those two it was difficult to choose. After long deliberation the town council selected that of Ghiberti as the winning panel. Today these panels hang side by side in the Bargello, a Florence museum, and authorities still argue their respective merits.

It has been claimed that Brunelleschi acknowledged the superiority of Ghiberti's panel and urged its selection. This generous act seems hardly credible as Brunelleschi was temperamental, high-aspiring, and expected recognition. He had been beaten in the art at which he wished to excel, and he was bitterly disappointed at his failure. He was offered an inferior commission as Ghiberti's associate, but this he refused. He was determined to be not less than first in whatever he undertook. From that day there is no record of Brunelleschi's ever again setting his hand to a piece of sculpture.

Brunelleschi In Rome.

The following year Brunelleschi left Florence for Rome accompanied by a young friend who later gained fame as the sculptor Donatello. In Rome Brunelleschi stood amazed and stunned before the magnificence and perfection of the ancient but then well-preserved Roman buildings which had been raised by the greatest structural engineers of antiquity. While supporting himself by occasional work as a goldsmith, he tirelessly devoted

himself to studying the Roman means of construction, and with the aid of his friend Donatello measured plans and details. Brunelleschi now had two great purposes in life: To revive this Roman architecture which he admired so much, and to discover a means of constructing the unfinished dome of the Cathedral of Florence. When in 1407 he learned that the construction of the dome was being contemplated, he hurried back to his native city.

The Cathedral of Florence had had a long history. It had been designed and begun by Arnolfo di Cambio in 1296. Construction had ceased on Arnolfo's death in 1311, was resumed in 1334 by Giotto, and interrupted again by the "Black Death" in 1348. The plan was enlarged in 1350, and it was increased once more when a commission of architects laid out the choir and transepts in 1366. Now in 1407, more than a century after its conception, the construction of the greatly enlarged dome seemed to offer insurmountable difficulties.

Upon Brunelleschi's recommendations, an octagonal drum was raised above the roof of the cathedral with a great circular window in each face of the octagon to give light to the dome, and to concentrate the weight of the dome on the eight great piers below the drum. He was also commissioned to add three apses to the cathedral, but once again construction came to a standstill. The dome was now raised on a drum 180 ft. high and was 138 ft. 6 in. in diameter. Other designers looked askance. How was it possible to build anything so large?

Except for Brunelleschi, all builders considered scaffolding and centering indispensable to the construction of the dome. This would have required a tremendous amount of labor and material. The scaffolding would have to be raised 180 ft. from the floor before it could begin to support the dome, and it would have to rise 300 ft. in order to support the eye of the dome. Central Italy was barren, virtually treeless, and it was doubtful that such a vast quantity of lumber as was needed could be acquired.

During the years 1407 to 1417 Brunelleschi gravitated between Florence and Rome. In Rome he continued his studies of Roman construction, such as the turning of vaults and arches, and the clamping and interlocking of brick and stone, always with the thought in mind of the construction of the great dome. In Florence he carried on heated discussions with the city council and other builders, he was ridiculed for his impossible scheme of building a dome without centering, and he on his part refused to show his methods or divulge the secret by which he planned to do this.

The Council of Architects.

In 1420, at Brunelleschi's urging, a council of architects was called in Florence to consider means of construction for the dome. Several solutions were offered at this assembly of which one was to erect a great column 200 ft. high in the center of the floor and support the scaffolding for the dome on it.

But the most ingenious proposal of all was to raise a great mound of earth from the floor of the cathedral upon which the dome could be formed. Gold coins were to be sprinkled at intervals in the earth, and with the dome completed the doors were to be thrown open. The townspeople would fight among themselves for the privilege of removing the earth for the coins it contained!

Brunelleschi's proposal of not using scaffolding was first treated with derision, (he was even ejected from the assembly), but his self-confidence and persistence finally turned the city council in his favor. He elaborated his scheme in somewhat more detail and built two small chapel domes without centering as proof of his ability. In 1420 Brunelleschi was commissioned to start construction on the dome.

Brunelleschi's method of construction is not exactly known even at this time. It is related that once he built a small hemispherical dome with a single timber brace. This brace was hinged at the center of curvature of the dome and could swing around to support each stone as it was being laid to interlock with the other stones. This method could not have been used on the cathedral dome which was both octagonal and pointed.

It is believed that Brunelleschi built the dome to a height at which the inward lean became marked. Here he probably left projecting cogs on the inner face, which supported centering sprung horizontally across the dome. This centering could be moved to a higher level as the dome was raised, until the ribs met in the great eye of the dome which was left for lighting. This construction would give a tremendous saving on scaffolding. It may be that Brunelleschi did not use even this small amount of centering. Perhaps he depended entirely upon carefully designed and interlocked stones to support the dome.

An Unwelcome Associate.

Brunelleschi's pleasure at winning the commission was soon tempered with disappointment. Perhaps the council did not entirely trust his constructive ability, perhaps they remembered that he had been defeated in a previous competition, for Lorenzo Ghiberti, his successful competitor for the bronze gates, was appointed as co-architect.

Brunelleschi resented Ghiberti's acceptance of this commission. This resentment grew to enmity during the next three years as he saw his colleague who was a sculptor, not an engineer nor an architect, and who spent most of his time on the great pair of bronze doors for the Baptistery, receive both pay and credit for the constructive innovations of Brunelleschi.

The day came when the dome had reached a height where some new means of construction must be adopted. That day Brunelleschi wrapped his head in towels, took to his bed, and moaned of terrible sickness. To the workmen who came for instructions he said: "I am too sick. Ghiberti is co-architect. Consult Ghiberti." Ghiberti, who knew not how to proceed, tried to excuse

The Cathedral of Florence, Bell Tower by Giotto; the Dome by Brunelleschi, is almost four times the height of the Ohio Stadium.



himself by saying he would do nothing without Brunelleschi. Construction came to a standstill, the workmen grumbled, the city council was pressed into an investigation, and the result was the resignation of Ghiberti. Brunelleschi arose from his sick bed and happily resumed charge of the dome.

(Ghiberti devoted himself to his bronze doors, finished them in 1424, and was commissioned to execute the one remaining pair of doors for the Baptistry, which he did in the new Renaissance style during the next twenty-seven years. These bronze doors are classed among the finest works of art of all time, and Lorenzo Ghiberti is remembered as a truly great sculptor).

During the next 10 years construction proceeded on the dome under the sole guidance of Brunelleschi. Giorgio Vasari, who wrote Brunelleschi's biography in 1550, relates many particulars about the construction,—how Brunelleschi crushed a strike of the workmen by training an entirely new crew, how he carefully designed conduits for rain water and left apertures to diminish the force of the wind, how he designed pulley systems and machines to raise brick and stones to the workmen, how he designed scaffolds in the dome to support the cranes that lifted the materials, with other scaffolds to keep the men from becoming nauseated and shaking with fear from the dizzy depth below as they worked on the shell of the dome, and finally how he built wine shops and eating places in the top of the dome where food and drink were sold to the workmen to save them the inconvenience and loss of time of descending to the ground. Brunelleschi labored constantly, and personally inspected the brick, stone, and iron that went into the dome.

The Constructive System.

The dome as designed is octagonal with eight vast ribs of stone rising from the octagonal drum below. Re-

tween each pair of great ribs are two smaller ribs, linked to the major ribs by nine arches of masonry lying in planes normal to the curve. Two shells of masonry are attached to the interior and exterior of the minor ribs; the great ribs project through both shells.

Completely around the haunch of the dome, about 23 ft. above the base, is a chain of 24 heavy timber sections clamped together at the ends with plates of iron. Great iron chains are imbedded in the masonry at the base completely encircling the dome to prevent outward thrusts against the 16 ft. thick walls of the supporting drum. The dome is pointed to give less outward thrust, and Brunelleschi planned a heavy lantern to close the eye of the dome, believing that this mass would add stability. This great dome, which dwarfs the rest of the Cathedral and all surrounding buildings, is almost 385 ft. in height from floor of the Cathedral to cross on top of the lantern.

All previous domes had been low and sunk in walls which acted as strong buttresses against the thrusts of the dome. Brunelleschi's dome was too high to be buttressed; therefore he had to resort to chains to hold it together. This dome of the Cathedral of Florence was the first of the Renaissance domes such as St. Peter's in Rome, St. Paul's in London, and that of our own Capitol in Washington.

Brunelleschi's dome was completed in 1434. For the design of the lantern, he once more had to place his models in competition with those of other artists. This lantern surmounting the dome was completed in 1461 following Brunelleschi's designs, after his death. The fanciful Florentines believed that the many delays in the construction and the frequent lightning that played around the lantern signified heaven's jealousy of their beautiful dome.

In 1693 ruptures were first noticed in the dome, and a slight earthquake in 1697 opened others. These seem to have been caused by a sinking of the foundations, but the structure is regarded as entirely safe. It may stand for centuries to come, a remarkable constructive achievement and a beautiful work of art.

The Renaissance of Architecture.

Though his feats in construction were great, Brunelleschi is best remembered in the history of architecture as the first "Renaissance" designer. He had stood in wonder before the grandeur of the Roman buildings. This Roman architecture which he admired so much had died when the barbarians overran Rome, and had been succeeded by several styles. First had come a poverty-stricken architecture known as "Early Christian." This was followed by Romanesque, a development of Roman architecture, and this in Northern Europe developed into the Gothic style. Gothic architecture was characterized by fanciful pinnacles, buttresses, pointed arches, tall, narrow vaults, towers, thin statuary, great stained glass windows, and a certain lightness which made it delightfully picturesque. It reached its peak of development in the great cathedrals of Northern France.

Gothic architecture had been brought across the Alps into Italy. It was this architecture that Brunelleschi had known in his youth. The designing which he commenced in the old Roman manner of columns and porticos, round arches, domes and classical details was called "Renaissance" or the "rebirth" of classical architecture. It was then that the former architecture, in contempt, was first called Gothic, meaning "barbarous."

The Capella Pazzi, Florence



While working on the Cathedral, Brunelleschi executed several smaller buildings in Florence, all in this Renaissance style which he was first to introduce. The Capella Pazzi, the delicate little chapel of the Pazzi family begun in 1420, was the first Renaissance building in all Europe. It had been preceded by a loggia or arcaded porch for the existing Ospedale degli Innocenti, (the Hospital of the Foundlings), in 1419, and was followed by the domed churches of San Lorenzo in 1425 and San Spirito, 1433-1482. Into all this "Roman architecture Brunelleschi introduced his own original taste in design.

Other Italian architects began to imitate Brunelleschi's style; others came to Rome to study the Roman buildings as he had been first to do. By 1520 Renaissance architecture had crossed the Alps into France, in 1620 it had reached England, and until about 1800 it lingered in England and Colonial America in the style known as the "Georgian." The architects who designed in this style, and who took the almost indispensable trip to Rome for study, were following the example of the man, Filippo Brunelleschi, who once had stood alone and awestruck before the architecture of the ancients.

The Medici.

In 1430 Brunelleschi entered a competition to design the palace of Cosimo di Medici. The Medici family then had not yet attained the predominant position in the affairs of Florence that it was later to assume. It was but another great Florentine family whose safety demanded a town palace with a heavy, fortress-like exterior with stables for horses and barracks for retainers and guards on the interior.

Brunelleschi with great patience and care prepared a grand design which Cosimo di Medici considered too sumptuous and too likely to excite the malice of his fellow citizens. "Envy is a plant one should never water," he is reported to have said. Brunelleschi in the heat of anger broke his carefully prepared model into a thousand pieces. Cosimo chose the less costly but still striking and massive design of Michelozzo Michelozzi, an accomplished architect and sculptor, whose building is today known as the Palazzo Medici-Riccardi, after the present owners.

About this time great political events were taking place in Florence. With much enthusiasm the city was led into war against the city of Lucca by Rinaldo degli Albizzi, controller of the ruling guilds of Florence. Brunelleschi was sent to attempt engineering operations against Lucca. These operations were unsuccessful, the war went badly for the Florentines, and Rinaldo degli Albizzi found himself undermined at home by the people's protests led by the wealthy banker, Cosimo di Medici. This menace had to be removed, so Cosimo was banished by the powerful Albizzi faction in 1433. He was quickly recalled in 1434 when Florence, then fighting Milan, discovered that her only citizen banker

with money for large war loans had been driven away. The Albizzis fled Florence for ever upon his return.

Cosimo became absolute ruler of the republic and patron of all the arts. His power he hid behind the magistrates and officials whom he controlled by his wealth; his patronage he showed by his employment of many artists and architects, including Brunelleschi.

Cosimo employed Brunelleschi upon several projects, and on one occasion lent him to the Pope at Rome for some engineering works, saying that here was a man "capable of turning the earth on axis" with his engineering ability.

Though Brunelleschi had failed to design the palace of Cosimo di Medici, the upheaval in Florence raised a personage who desired the sumptuous kind of palace which he, Brunelleschi, wished to build. This was Luca Pitti, chief magistrate of the republic and lieutenant to Cosimo di Medici. Pitti was wringing a tremendous fortune from the citizens of Florence through tyranny and corruption of justice, and the palace which Brunelleschi commenced erecting for him in 1435 is exceeded only by the Vatican and the Golden House of Nero as the largest residence ever erected in Italy. With the additions after Brunelleschi's death, its front is 475 ft. long, it is 114 ft. high, (and Brunelleschi probably planned another story height), and the great windows are 24 ft. from center to center. It is so large in scale that it is difficult to conceive its size from any photograph.

Brunelleschi died before he could complete the Pitti Palace. Later Luca Pitti led the opposition to Piero di Medici, Cosimo's son; the citizens turned upon him because of his corruption, and he was forced to flee the city. Brunelleschi's plans were lost, and when the palace was completed in 1568 for the Medici family, it was by the design and direction of the architect Ammanati.

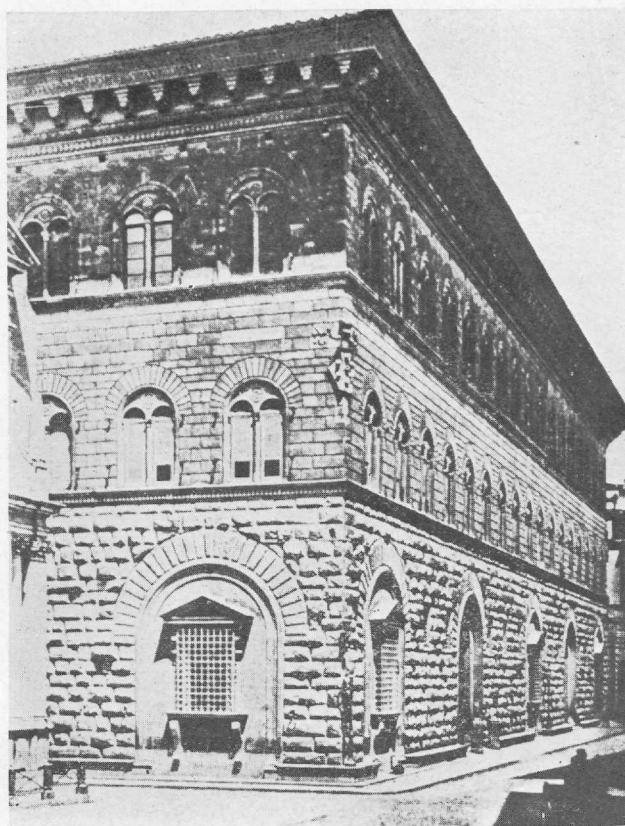
Brunelleschi's part of the Pitti Palace, the great facade, has been both criticized and praised for its simplicity and severity.

One year before his death Brunelleschi designed a palace for the Pazzi family. When executed the palace was adorned with sculptured shields by the sculptor Donatello, his life-long friend and collaborator, and his companion on the first trip to Rome, who embellished many of his other structures including the Pazzi chapel, the first Renaissance building. It is said the friendship of the two men was nearly broken in the last years by Brunelleschi's angry criticism of certain architectural details added by Donatello to a building of Brunelleschi's without his knowledge.

The palace which Brunelleschi designed for the Pazzis was left deserted in 1478 when a conspiracy of that family to murder the Medicis resulted in execution, lynching, and banishment of the Pazzis. The palace is now known as the Palazzo Quaratesi.

Brunelleschi In Military Engineering.

Brunelleschi was recognized also as a skilled military engineer. He designed various citadels and fortifica-

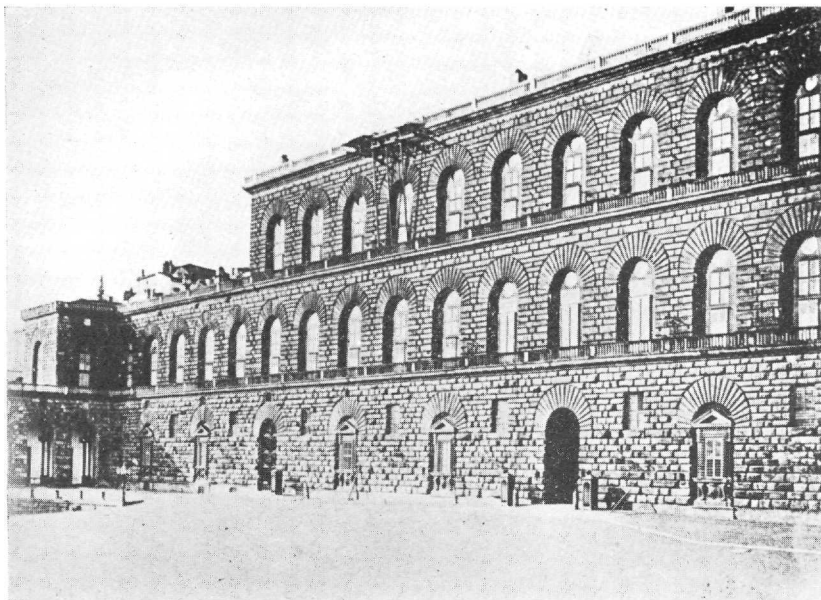


The Palazzo Medici—Riccardi,
—by Michelozzo

tions for the cities of Pisa and Pesaro, which were subject to Florence, and dams on the river Po for the city of Mantua. However, his reputation was dimmed somewhat in 1429-30 during the war with Lucca, by which the Medici family gained power in Florence. He had been sent to the Florentine army outside Lucca, with Donatello and Michelozzo among others for assistants. There he conceived the idea of enclosing the city with trenches and laying it under water by diverting the river Serchio. But his plans did not develop as he had expected, and by his operations Lucca became an island and an unapproachable fortress. Many Florentines died at the works and others died in attempting to cross the stream. It was called the "mad inundation" and Brunelleschi retired under much censure.

Vasari, the biographer, mentions many other accomplishments of Brunelleschi, such as the design of machines for pageants, and—as a young man—the making of several watches, the invention of some kind of "construction" for ferrying merchandise across the Arno at all times, and absolute mastery of the science of perspective. He is shown as a very likeable sort of person, ambitious, clever, hot-blooded, temperamental, tireless, trying to do so much, often failing of success by so little, and being so human in his disappointments.

Filippo Brunelleschi died on April 16, 1446, at the age of 69, with the lantern of the great dome still rising, with the Pitti palace and the church of San Spirito in



The Pitti Palace
by Brunelleschi

Now a residence of King Victor Emmanuel of Italy. The size is shown by the sentries and sentry boxes by the doorways.

progress of construction, and with the plans prepared for the Quaratesi palace. It is said that his death was mourned by all his countrymen.

There is an exquisitely carved crucifix of wood in the church of Santa Maria Novella in Florence. It was

done sometime before the year 1400, and is a poignant reminder of the young man whose disappointment in not being first in sculpture urged him on to seek and attain highest honors among the architects and engineers of the world.
